Proposal to Reduce idling from New 2007+ Heavy-Duty Diesel Trucks

Public Workshop

June 4, 2003

California Environmental Protection Agency
Air Resources Board

Agenda

- Overview
  - Need for control
  - Reasons for idling
  - Extent of idling
  - Emissions impacts
  - Available options to reduce idling
- Proposed solution
- Schedule
- Discussion

Need for Control

- Emissions from idling trucks
  - Highly localized and concentrated (truck stops, rest areas, distribution centers, ports, etc.)
  - Threat to public health
  - More serious in EJ communities
- SIP requirement
  - More reductions needed in non-attainment areas
  - Federal highway funds at risk

Why Trucks Idle?

- Heat or cool cab/sleeper compartments
- Warm the engine for easy start-up during cold weather conditions
- Power cab/sleeper appliances (refrigerator, television, laptop, etc.)
- Power to run auxiliary devices
- Habit
- Mask outside noise

California truck drivers idle

- At truck stops, rest areas, ports, distribution centers, etc.
- Primarily for climate control purposes
  - 83% idle to power the air conditioner
  - 67% idle to power the heater
  - 17% idle because other drivers are idling
  - 13% idle for other reasons

Source: SAE 2001-01-2828

How much truck idling?

- Idling times vary by season and location
- U.S. DOE Study
  - long-haul trucks with a typical trip > 500 miles from their home base
  - national average: 6 hours/day (1818 hours/year) (Stodolsky et. al., 2000)

How much truck idling?

ARB's Analysis (EMFAC2002 ver 2.02)

- Based on GPS data logger instrumented truck data study
- 84 Heavy-Heavy Trucks (GVWR > 33,000 lbs.)
  - long-haul+short-haul trucks with idle time >5 min
  - fleet average HHDT: 105 minutes/day (640 hrs/year)
    (http://www.arb.ca.gov/msei/on-road/latest_revisions.htm#hhddt_idle)
- 34 Medium-Heavy Trucks (14K<GVWR<33K lbs)
  - fleet average MHDT: 6 minutes/day (36 hrs/year)

Idle Emission Rates

EMFAC2002 Ver. 2.2

All Model Years	HC (g/hr)	CO (g/hr)	NOx (g/hr)	CO2 (g/hr)
	3.48	26.3	80.7	4098

PM Idle Emission Rates

Model Year	Pre-1988	1988-90	1991-93	1994+
PM (g/hr)	5.370	3.174	1.860	1.004

- HC, CO, NOx and CO2 from tests conducted by WVU
- PM rates are from Part 5 (US EPA)

Emissions Impact - CY 2010

EMFAC2002 Ver 2.2	Statewide		South Coast AB	
	MHD	HHD	MHD	HHD
CA-Registered Vehicles	200,087	150,560	77,447	57,544
NO_x (tpd)	**1.7**	**22.6**	**0.7**	**8.6**
ROG (tpd)	0.09	1.23	0.04	0.47
PM (tpd)	0.03	0.42	0.01	0.16
CO (tpd)	0.3	7.4	0.2	2.8
Diesel Fuel[1] Consumption (gal/day)	12,005	263,480	4,647	100,702

[1]Assumes diesel fuel consumption of 1 gall/hr for HHDV and 0.6 gall/hr for MHDV.

Technology Options

- Idle Limiting Devices
- Auxiliary Devices
- Truck Stop Electrification (TSE)
- Advanced TSE

Idle Limiting Devices

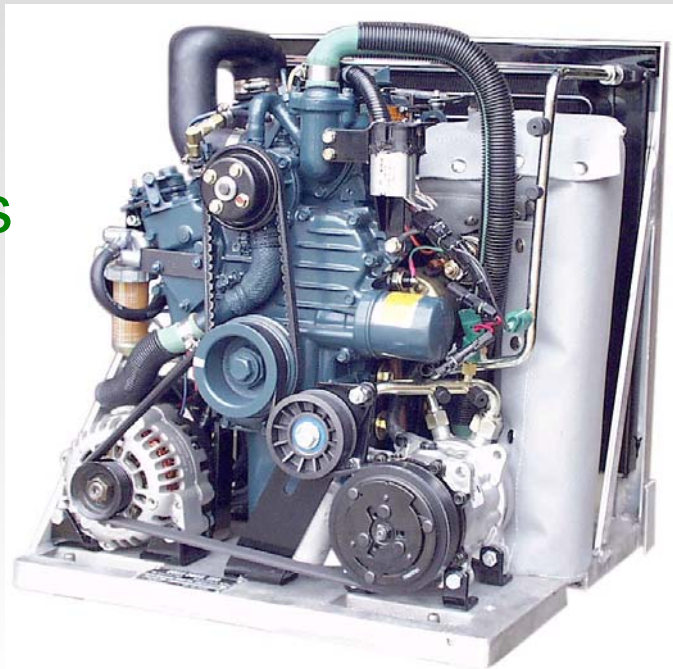
- Idle Shutdown Timer
  - shuts off the engine after a set time
  - available in all electronic engines
- Automatic Start/Stop System
  - automatically stops and restarts the engine based on battery voltage and engine and/or cab/sleeper thermostat settings
  - available as a factory option with DDC, Cummins, Caterpillar and Mack engines.
  - cost: $1,200 to $2,000
  - drawback: start/stop may be sleep disruptive

Auxiliary Devices

- Direct Fired Heater
  - provides heat to cab/sleeper or engine or both
  - compact and high heating efficiency
  - uses on-board fuel and truck batteries for power
  - cost: $1,000 to $3,000
  - drawbacks: no cooling, and may drain batteries

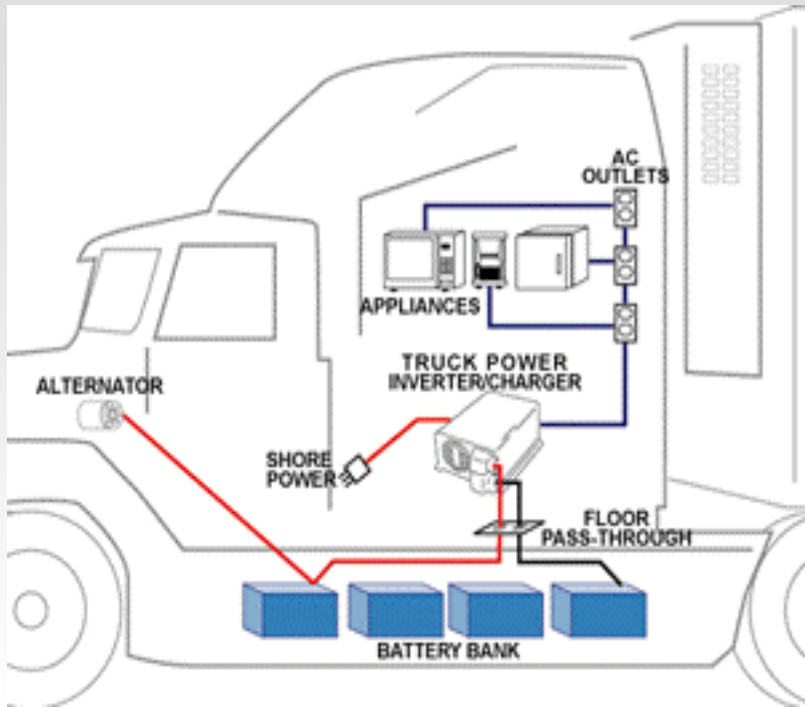
Auxiliary Devices

- Auxiliary Power Units
  - uses a small off-road diesel engine (~10 to 15hp) and on-board fuel
  - equipped with an alternator/generator to provide electrical power
  - heating, cooling, engine warming and electrical power for battery charging and on-board appliances
  - cost: $5,000 to $8,000
  - drawbacks: heavy, needs maintenance, high initial cost



Truck Stop Electrification

- 110 V AC at truck stops: for heating, cooling and for battery charging and on-board appliances
- requires electrical oultlets at parking spaces, and inverter/chargers and electrical connections on trucks
- inverter/chargers - offered as options by Volvo, Freightliner, and International.
- cost: $1,700 to $2,400 per parking space and $1,400 for truck add-on.
- drawbacks: high infrastructure costs, add-on to trucks and available only at truck stops.



Truck Stop Electrification

- Advanced Truck Stop Electrification
  - truck modifications not needed
  - independent HVAC units for each truck installed above each parking space
  - 110 V AC power outlets for on-board appliances
  - telephone, internet and television services
  - $1.25 per hour for basic services
  - drawbacks: high infrastructure costs and available only at truck stops

Proposed Solution

- Require idle shutdown timer
  - all new 2007+ MY heavy-duty trucks, GVWR > 14,000 lbs.
  - shuts off the engine if idle time > 5 minutes
  - tamper-resistant and non-adjustable
  - allow the option to use auxiliary power units
  - APUs must meet CA emission standards for small off-road engines
- Trucks with sleepers
  - allow optional use of automatic start/stop systems
  - minimum of 50% idle reduction during ambient conditions of 95°F.

Proposed Solution

- Monitor the system for proper functioning using the on-board diagnostics system to be implemented for HDVs in 2007
- Include a functional inspection of the idle shutdown timer in the HDVIP program

Emissions Reductions

Preliminary Estimates (tpd)

Assumptions:

Percent of Trucks w/ sleepers	20%
Percent reduction using auto start/stop system	50%
Percent reduction using idle shutdown timer (HHDD)	95%
Percent reduction using idle shutdown timer (MHDD)	17%

	Statewide			South Coast AB		
	2010	2015	2020	2010	2015	2020
NOx	**4.58**	**10.86**	**16.90**	**1.91**	**4.49**	**6.83**
ROG	0.25	0.60	0.92	0.10	0.25	0.37
PM	0.06	0.14	0.21	0.03	0.06	0.09
CO	1.49	3.54	5.51	0.62	1.46	2.23
CO2	0.24	0.55	0.86	0.10	0.23	0.35

Emissions Reductions

Inventory improvements needed:

- emission rates in the inventory were obtained at low idle speeds with no loading
- NOx at elevated RPM and with HVAC loading is approximately double that observed at low idle with no HVAC loading. (CATI, U.S. EPA, UC-Davis, studies).
- idle time for medium-heavy diesel engines may change.
- change methodology to calculate emission reductions, e.g.., keeping the fleet average of 1.75 hrs/day idle time but assuming 20% of them (w/sleepers) idle at 6 hrs/day and the remaining 80% (w/o sleepers) at 0.69 hrs/day.
- Requirement of 50% reduction from automatic start/stop system is under severe conditions (95ºF) - benefit may be more than 50%, since average temperatures are most of the time lower than 95ºF..

Comments

- Emission rates: not representative of long duration idling trucks with HVAC loading
- Why start with the 2007 MY and why not earlier?
- What will the ARB do with pre-2007 MY trucks?
- Does the requirement apply to government as well as private fleets?
- Are there exemptions for vehicles that require power to operate auxiliary devices (e.g.. cement mixers, emergency vehicles, etc.)?

Schedule

- Meetings with manufacturers and stakeholders: June - July 2003
- Staff report and draft regulatory language: August - September 2003
- Board hearing: November 13, 2003.

Contact information

- Daniel Hawelti - (626) 450-6149 (dhawelti@arb.ca.gov)
- Truck idling listserve:
  - http://www.arb.ca.gov/listserv/truck-idling/truck-idling.htm
- Truck idling website:
  - http://www.arb.ca.gov/msprog/truck-idling/truck-idling.htm